SEQUENCE LISTING

<110> Duvick, Jon
Maddox, Joyce
Gilliam, Jacob
Folkerts, Otto
Crasta, Oswald R.

<120> Compositions and Methods for Fumonisin Detoxification

<130> 35718/208255

<140> 09/882,694
<141> 2001-06-15

<150> 09/351,224
<151> 1999-07-12

<160> 11

<170> FastSEQ for Windows Version 4.0

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<212> DNA
<213> Exophiala spinifera

<220>
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<222> (0)...(0)
<223> flavin monooxygenase with intron

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<210> 2
<211> 1638
<212> DNA
<213> Exophiala spinifera

<220>
<221> misc_feature
<222> (0)...(0)
<223> flavin monooxygenase, fully spliced

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<210> 3
<211> 545
<212> PRT
<213> Exophiala spinifera

<400> 3

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Phe Gly Gly Val Trp His Trp Asn Arg Tyr Pro Gly Ala Arg Val Asp
    50                  55                  60
Ser Glu Thr Pro Phe Tyr Gln Leu Asn Ile Pro Glu Val Trp Lys Asp
65                  70                  75                  80
Trp Thr Trp Ser Cys Arg Tyr Pro Asp Gln Lys Glu Leu Leu Ser Tyr
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Val His His Cys Asp Lys Ile Arg Gly Leu Arg Lys Asp Val Tyr Phe
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Gly Ala Glu Val Val Asp Ala Arg Tyr Ala Arg Asp Leu Gly Thr Trp
        115                 120                 125
Thr Val Lys Thr Ser Ala Gly His Val Ala Thr Ala Lys Tyr Leu Ile
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Leu Ala Thr Gly Leu Leu His Arg Lys His Thr Pro Ala Leu Pro Gly
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Leu Ala Asp Phe Asn Gly Lys Val Ile His Ser Ser Ala Trp His Glu
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Asp Phe Asp Ala Glu Gly Gln Arg Val Ala Val Ile Gly Ala Gly Ala
            180                 185                 190
Thr Ser Ile Gln Ile Val Gln Glu Leu Ala Lys Lys Ala Asp Gln Val
        195                 200                 205
Thr Met Phe Met Arg Arg Pro Ser Tyr Cys Leu Pro Met Arg Gln Arg
    210                 215                 220
Thr Met Asp Arg Asn Glu Gln Thr Ala Trp Lys Ala Tyr Tyr Pro Thr
225                 230                 235                 240
Leu Phe Glu Ala Ser Arg Lys Ser Arg Ile Gly Phe Pro Val Gln Ala
                245                 250                 255
Pro Ser Val Gly Ile Phe Glu Val Ser Pro Glu Gln Arg Glu Ala Tyr
            260                 265                 270
Phe Glu Glu Leu Trp Glu Arg Gly Ala Phe Asn Phe Leu Ala Cys Gln
        275                 280                 285
Tyr Arg Glu Val Met Val Asp Lys Lys Ala Asn Arg Leu Val Tyr Asp
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Phe Trp Ala Lys Lys Thr Arg Ser Arg Ile Val Asn Pro Ala Lys Arg
305                 310                 315                 320
Asp Leu Met Ala Pro Leu Glu Pro Pro Tyr Trp Phe Gly Thr Lys Arg
                325                 330                 335
Ser Pro Leu Glu Ser Asp Tyr Tyr Glu Met Leu Asp Lys Pro Ser Val
            340                 345                 350
Glu Ile Val Asn Leu Glu Gln Ser Pro Ile Val Ala Val Thr Lys Thr
        355                 360                 365
Gly Val Leu Leu Ser Asp Gly Ser Lys Arg Glu Cys Asp Thr Ile Val
    370                 375                 380
Leu Ala Thr Gly Phe Asp Ser Phe Thr Gly Ser Leu Thr His Met Gly
385                 390                 395                 400
Leu Lys Asn Lys His Gly Val Asp Leu Lys Glu Val Trp Lys Asp Gly
                405                 410                 415
Ile Ser Thr Tyr Met Gly Val Phe Ser His Gly Phe Pro Asn Ala Phe
            420                 425                 430
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Phe Val Ala Thr Ala Gln Ala Pro Thr Val Leu Ser Asn Gly Pro Thr
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Ile Ile Glu Thr Gln Val Asp Leu Ile Ala Asp Thr Ile Ala Lys Leu
450 455 460
Glu Ala Glu His Ala Thr Ser Val Glu Ala Thr Lys Ser Ala Gln Glu
465 470 475 480
Ala Trp Ser Ile Met Ile Ala Lys Met Asn Glu His Thr Leu Phe Pro
485 490 495
Leu Thr Asp Ser Trp Trp Thr Gly Gly Asn Ile Pro Gly Lys Ala Thr
500 505 510
Arg Ala Leu Thr Phe Ile Gly Gly Ile Ala Leu Tyr Glu Gln Ile Cys
515 520 525
Gln Glu Lys Val Ala Asn Trp Asp Gly Phe Asp Val Leu His Ala Pro
530 535 540
Cys
545

<210> 4
<211> 1464
<212> DNA
<213> Exophiala spinifera

<220>
<221> misc_feature
<222> (0)...(0)
<223> aldehyde dehydrogenase, fully spliced cDNA

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gatgttcacg tggccaacgc ggccgatgtc gacagtgcag tagccgcttc ggtgcaggcg 180
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<211> 487
<212> PRT
<213> Exophiala spinifera

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Trp Asp Glu Ser Thr Val Ala Thr Asp Val His Val Ala Asn Ala Ala
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Asp Val Asp Ser Ala Val Ala Ala Ser Val Gln Ala Val Lys Lys Gly
    50   55   60
Pro Trp Lys Lys Phe Thr Gly Ala Gln Arg Ala Ala Cys Met Leu Lys
65   70   75   80
Phe Ala Asp Leu Ala Glu Lys Asn Ala Glu Lys Leu Ala Arg Leu Glu
                85   90   95
Ser Leu Pro Thr Gly Arg Pro Val Ser Met Ile Thr His Phe Asp Ile
            100   105   110
Pro Asn Met Val Ser Val Phe Arg Tyr Tyr Ala Gly Trp Ala Asp Lys
        115   120   125
Ile Ala Gly Lys Thr Phe Pro Glu Asp Asn Gly Lys Pro Asn Trp Arg
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Tyr Glu Pro Met Gly Val Cys Ala Gly Ile Ala Ser Trp Asn Ala Thr
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Phe Leu Tyr Val Gly Trp Lys Ile Ala Pro Ala Leu Ala Ala Gly Cys
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Ser Phe Ile Phe Lys Ala Ser Glu Lys Ser Pro Leu Gly Val Leu Gly
            180   185   190
Leu Ala Pro Leu Phe Ala Glu Ala Gly Phe Pro Pro Gly Val Val Gln
        195   200   205
Phe Leu Thr Gly Ala Arg Val Thr Gly Glu Ala Leu Ala Ser His Met
    210   215   220
Asp Ile Ala Lys Ile Ser Phe Thr Arg Ser Val Gly Gly Gly Arg Ala
225   230   235   240
Val Lys Gln Ala Thr Leu Lys Ser Asn Met Lys Arg Val Thr Leu Glu
                245   250   255
Leu Gly Glu Lys Pro Thr Ile Val Phe Asn Glu Ala Pro Leu Glu Arg
            260   265   270
Gln Ser Gly Glu Ser Ala Lys Asp Phe Ser Lys Phe Gly Gln Ile Trp
        275   280   285
Val Pro Pro Ser Cys Leu Leu Val Gln Trp Gly Asn Leu Ala Glu Lys
    290   295   300
Phe His Gly Val Arg His Gly Ser Phe Gly Gly Cys Gln Arg Trp Leu
305   310   315   320
Gly Gln Asn Pro Leu Glu Pro Lys Arg Thr His Gly Pro Phe Val Asp
                325   330   335
Lys Ser Gln Tyr Asp Arg Val Leu Gly Asn Ile Asp Val Gly Lys Asp
            340   345   350
Thr Ala Gln Leu Leu Thr Gly Val Gly Arg Lys Gly Asp Lys Gly Phe
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Ala Ile Glu Pro Thr Ile Phe Val Asn Pro Lys Pro Gly Ser Lys Ile
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Trp Phe Glu Glu Ile Phe Gly Pro Val Leu Ser Ile Lys Thr Phe Lys

385 390 395 400
Thr Glu Glu Glu Ala Ile Glu Ile Ala Asn Asp Thr Thr Tyr Gly Leu
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Ala Ser Val Ile Tyr Thr Lys Ser Leu Asn Arg Gly Leu Arg Val Ser
420 425 430
Ser Ala Leu Glu Thr Gly Gly Val Ser Ile Asn Phe Pro Phe Ile Pro
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Glu Thr Gln Thr Pro Phe Gly Gly Met Lys Gln Ser Gly Ser Gly Arg
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Asn Ile His Val Asn Ile Glu
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<212> DNA
<213> Exophiala spinifera

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<222> (0)...(0)
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tgctggggtg gtactgagag tctggattag ctgcaacgcg ggacaaccga gggtagaaca 1680
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aaaaaagcgg ccgctgaatt ctag 1764

<210> 7
<211> 1578
<212> DNA
<213> Exophiala spinifera

<220>
<221> misc_feature
<222> (0)...(0)
<223> permease, fully spliced cDNA

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<211> 525
<212> PRT
<213> Exophiala spinifera

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        35   40   45
Ser Leu Ala Phe Val Ile Cys Asn Ser Trp Ala Gly Ile Ser Gly Ser
    50   55   60

Leu Gln Leu Ala Leu Leu Ala Gly Gly Pro Val Thr Leu Leu Tyr Gly
65 70 75 80
Ile Leu Ile Ser Thr Leu Val Tyr Ile Cys Ile Ala Phe Ser Leu Ala
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Glu Leu Thr Ser Val Tyr Pro Thr Ala Gly Gly Gln Tyr His Phe Ala
100 105 110
Ser Ile Leu Ala Pro Lys Ser Ile Asn Arg Ser Ile Ser Tyr Val Cys
115 120 125
Gly Leu Val Ser Leu Leu Ser Trp Ile Ala Ile Gly Ser Ser Val Thr
130 135 140
Met Ile Pro Ala Gln Gln Ile Pro Ala Leu Ile Ala Ala Tyr Ser His
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Thr Tyr Ser Gln Asp Ser Trp His Val Phe Leu Ile Tyr Glu Gly Val
165 170 175
Ala Leu Val Val Leu Leu Phe Asn Leu Phe Ala Leu Lys Arg Asn Pro
180 185 190
Trp Val His Glu Ile Gly Phe Gly Leu Thr Ile Ala Leu Phe Val Ile
195 200 205
Ser Phe Ile Ala Ile Leu Ala Arg Ser Asn Pro Lys Ala Pro Asn Ser
210 215 220
Gln Val Trp Thr Ala Trp Ser Asn Tyr Thr Gly Trp Ser Asp Gly Val
225 230 235 240
Cys Phe Ile Leu Gly Leu Ser Thr Ser Cys Phe Met Phe Ile Gly Leu
245 250 255
Asp Ala Ala Met His Leu Ala Glu Glu Cys Thr Asp Ala Ala Arg Thr
260 265 270
Val Pro Lys Ala Val Val Ser Ala Ile Ile Ile Gly Phe Cys Thr Ala
275 280 285
Phe Pro Tyr Thr Ile Ala Val Leu Tyr Gly Ile Thr Asp Leu Asp Ser
290 295 300
Ile Leu Ser Ser Ala Gly Tyr Ile Pro Phe Glu Thr Met Thr Gln Ser
305 310 315 320
Leu Arg Ser Leu Ser Phe Ala Thr Val Leu Ser Cys Gly Gly Ile Val
325 330 335
Met Ala Phe Phe Ala Leu Asn Ala Val Gln Glu Thr Ala Ser Arg Leu
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Thr Trp Ser Phe Ala Arg Asp Asn Gly Leu Val Phe Ser Thr His Leu
355 360 365
Glu Arg Ile His Pro Arg Trp Gln Val Pro Val Trp Ser Leu Phe Ala
370 375 380
Thr Trp Gly Ile Leu Ala Thr Cys Gly Cys Ile Phe Leu Gly Ser Ser
385 390 395 400
Thr Ala Phe Asn Ala Leu Val Asn Ser Ala Val Val Leu Gln Gln Leu
405 410 415
Ser Phe Leu Ile Pro Ile Ala Leu Leu Leu Tyr Gln Lys Arg Asp Pro
420 425 430
Lys Phe Leu Pro Ser Thr Arg Ala Phe Val Leu Pro Arg Gly Ile Gly
435 440 445
Phe Leu Val Asn Val Leu Ala Val Val Phe Thr Ser Val Thr Thr Val
450 455 460
Phe Phe Ser Phe Pro Leu Thr Val Pro Thr Ala Ala Ser Thr Met Asn
465 470 475 480
Tyr Thr Ser Ala Ile Ile Gly Val Ala Leu Ala Leu Gly Val Leu Asn
485 490 495
Trp Val Val His Ala Arg Lys His Tyr Gln Gly Pro His Leu Glu Leu

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<213> Exophiala spinifera

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<223> p-glycoprotein, with introns

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<210> 10
<211> 3792
<212> DNA
<213> Exophiala spinifera

<220>
<221> misc_feature
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<223> p-glycoprotein, fully spliced cDNA

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<213> Exophiala spinifera

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Asn Val Ile Ala Leu Ile Cys Ala Ile Gly Ser Gly Ala Ser Leu Pro
    50                  55                  60
Leu Met Ser Ile Ile Phe Gly Ser Phe Thr Asn Lys Phe Asn Asn Tyr
65                  70                  75                  80
Asn Ser Gly Asp Gly Ser Pro Glu Ala Phe Lys Ala Asp Val Asp His
                85                  90                  95
Phe Val Leu Trp Phe Val Tyr Leu Phe Ile Gly Lys Phe Val Leu Thr
            100                 105                 110
Tyr Val Ser Thr Ala Ala Ile Thr Ile Ser Ala Ile Arg Thr Thr Arg
        115                 120                 125
Thr Leu Arg Arg Val Phe Leu Glu Cys Thr Leu Arg Gln Glu Val Trp
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His Phe Asp Lys Gln Ser Asn Gly Ala Ile Ala Thr Xaa Val Thr Thr
145                 150                 155                 160
Asn Gly Asn Arg Ile Gln Thr Gly Ile Ala Glu Lys Leu Val Phe Thr
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Val Gln Ala Leu Ser Met Phe Phe Ser Ala Phe Val Val Ala Leu Ala
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Ser Gln Trp Lys Leu Ala Leu Ile Thr Met Ser Val Ile Pro Ala Ile
        195                 200                 205
Phe Leu Val Thr Gly Ile Cys Ile Ala Ile Asp Ala Ala Gln Glu Ala
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Arg Ile Thr Arg Ile Tyr Ser Arg Ala Ala Val Leu Ala Glu Glu Val
225                 230                 235                 240
Leu Ser Ser Ile Arg Thr Val His Ala Phe Tyr Ala Gln Lys Lys Met
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Val Glu Lys Tyr Asp Val Phe Leu Gln Gln Ala His Gln Glu Gly Lys
            260                 265                 270
Lys Lys Ser Pro Asn Asn Gly Val Leu Phe Ser Thr Glu Tyr Phe Cys
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Ile Tyr Ala Ala Ile Ala Leu Ala Phe Trp Lys Gly Phe Arg Met Tyr
    290                 295                 300
Gln Asn Gly Glu Val Ala Asp Val Gly Lys Val Phe Thr Val Val Leu
305                 310                 315                 320
Ser Val Thr Leu Ala Ala Thr Ser Ile Ser Met Leu Ala Pro Ser Gly
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Ser Val Val Tyr Gln Arg Arg Ile Phe Gly Ser Glu Leu Phe Ser Ile
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Ile Asp Lys Pro Thr Gln Leu Asp Pro Leu Asp Pro Ser Gly Lys Gln
        355                 360                 365
Pro Glu Gly Cys Leu Gly Gln Ile Glu Ile Gln Asn Leu Ala Phe Ala
    370                 375                 380
Tyr Pro Ser Arg Pro Ser Ala Gln Val Leu Arg Asp Phe Asn Leu Thr
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385 390 395 400
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405 410 415
Lys Ser Thr Met Val Gly Leu Leu Glu Arg Trp Tyr Leu Pro Ser Ser
420 425 430
Gly Arg Ile Leu Leu Asp Gly Leu Glu Leu Gly Gln Tyr Asn Val Lys
435 440 445
Trp Leu Arg Ser Arg Ile Arg Leu Val Gln Gln Glu Pro Val Leu Phe
450 455 460
Arg Gly Thr Ile Phe Gln Asn Ile Ala Asn Gly Phe Met Asp Glu Gln
465 470 475 480
Arg Asp Leu Pro Arg Glu Lys Gln Met Glu Leu Val Gln Lys Ala Cys
485 490 495
Lys Ala Ser Asn Gly Asp Val Phe Ile Asn Glu Leu Pro Asn Gly Tyr
500 505 510
Glu Thr Glu Val Gly Glu Arg Ala Gly Ala Leu Ser Gly Gly Gln Arg
515 520 525
Gln Arg Ile Ala Ile Ala Arg Ser Ile Ile Ser Asp Pro Lys Ile Leu
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Leu Leu Asp Glu Ala Thr Ser Ala Leu Asp Pro Lys Ala Glu Lys Val
545 550 555 560
Val Gln Glu Ala Leu Asn Arg Val Ser Lys Asp Arg Thr Thr Leu Val
565 570 575
Ile Ala His Lys Leu Ala Thr Val Lys Ser Ala Gly Asn Ile Ala Val
580 585 590
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Arg Glu Ala Ala Gly Glu Arg Pro Ala Leu Glu Arg Thr His Thr Thr
645 650 655
Ala Thr Ser Gln Ala Gly Asp Leu Glu Lys Arg Lys Val Pro Val Gly
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740 745 750
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755 760 765
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770 775 780
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785 790 795 800
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820 825 830

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Ala Arg Ser Arg Lys Leu Gly Lys Leu Cys Arg Lys Cys Trp Ala Cys
865                 870                 875                 880
Lys Arg Ser Ser Tyr Arg Asp Pro Asp Arg Leu Ile Phe Asp Ser Arg
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Arg Pro Cys Ser Pro Thr Val Leu Gly His Val Glu Gln Gly Leu Ala
            900                 905                 910
Lys Ile Ile Gln Ser Phe Trp Phe Gly Arg Cys Phe Gly Phe His Leu
        915                 920                 925
Ser Gln Ser Met Glu Phe Leu Ala Ile Ala Leu Gly Phe Cys Ile Ala
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Val Asp Asn Trp Leu Gln Val Ser Thr Thr Gln Leu Asn Phe Ile Ser
945                 950                 955                 960
Ser Ser Trp Ala Phe Cys Leu Pro Val Gln Ala Ala Ala Gln Tyr Leu
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Ala Tyr Ser Thr Ser Phe Thr Lys Ala Arg Ser Ala Ala Asn Tyr Ile
            980                 985                 990
Leu Trp Leu Arg Thr Leu Lys Pro Thr Ile Arg Glu Thr Glu Glu Asn
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Lys Lys Lys Gly Pro Val Gly Gly Cys Pro Val Asp Leu Glu Asp Ile
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Glu Phe Arg Tyr Arg Gln Arg Asp Ser Ala Arg Val Leu Arg Gly Val
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Gly Cys Gly Lys Ser Thr Leu Ile Ala Leu Ser Glu Arg Phe Tyr Asp
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Pro Thr Ser Gly Arg Ile Ser Phe Ala His Glu Asn Ile Ala Glu Met
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Glu Ala Thr Ser Ala Leu Asp Thr Gln Ser Glu Arg Leu Val Gln Ala
1185                1190                1195                1200
Ala Leu Asp Glu Ala Ser Thr Ser Arg Thr Thr Ile Ala Val Ala His
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Arg Leu Ser Thr Ile Arg Asn Val Asp Val Ile Phe Val Phe Ala Asn
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Gly Arg Ile Ala Glu Thr Gly Thr His Ala Glu Leu Gln Arg Leu Arg
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Gly Arg Tyr Tyr Glu Met Cys Leu Ala Gln Ser Leu Asp Gln Ala
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